

- Objectives :
 - Assess accuracy of airborne IPDA lidar measurements of CO₂ column conc. (XCO₂)
 - Extend these lidar measurements, for the first time, to the Arctic
 - Use transits flights to assess airborne lidar's capability to measure north-south gradient(s) in XCO₂
- Teams & instruments:
 - In Situ: CO₂, CH₄, WV, CO concentrations at aircraft:
 - **AVOCET** – in situ sensor from LaRC - led by Josh DiGangi & Yonghoon Choi,
 - **Picarro** - in situ sensor from GSFC - led by Randy Kawa and Jianping Mao
 - **DACOM/DLH** - in situ sensor from LaRC - led by Glenn Diskin
 - Lidar: surface height & conditions in column to surface:
 - **CO₂ Sounder** - lidar from GSFC - led by Haris Riris and Graham Allan
 - **ACES** - lidar from LaRC - led by Mike Obland, Byron Meadows, Jon Hicks



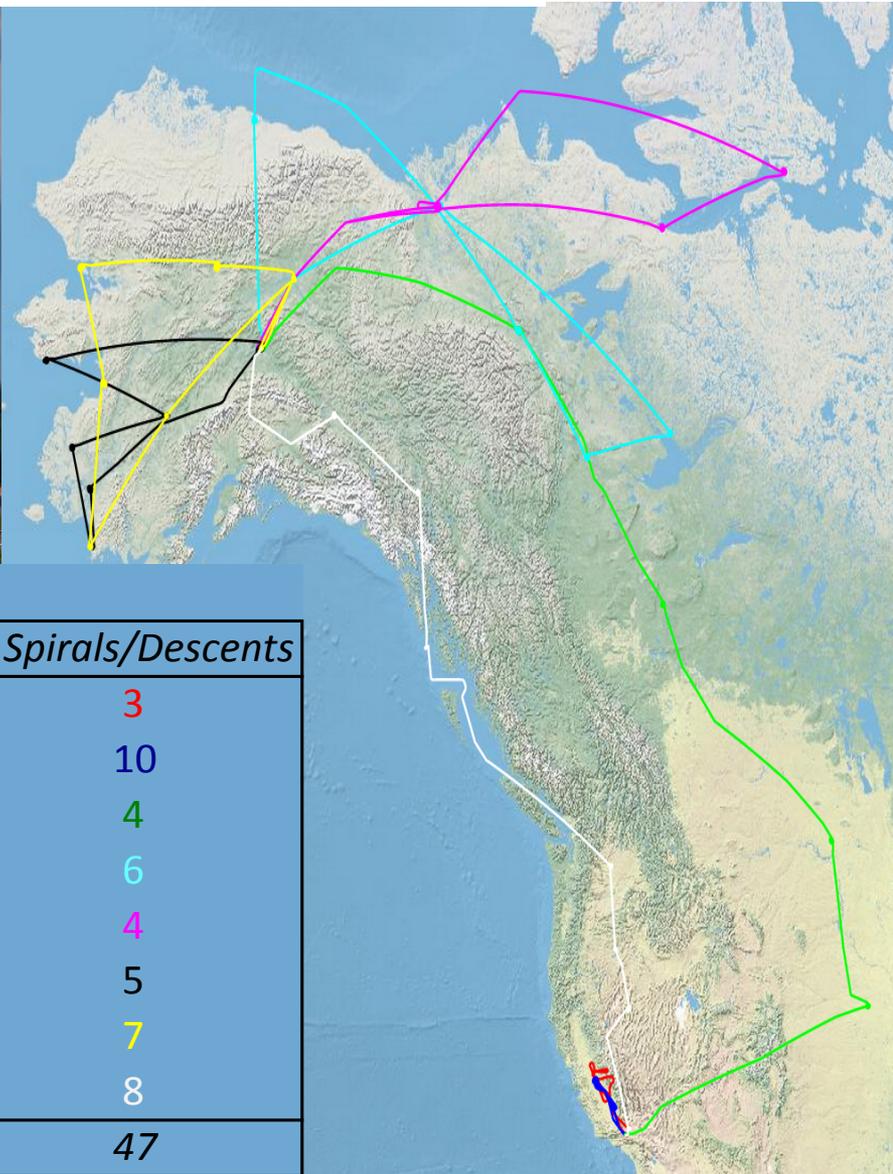


Overview - 2017 ASCENDS Airborne Campaign

Jul 20 - Aug 8, 2017



NASA DC-8 Landing at Fairbanks
Alaska on July 27



Flights & Legend:

<i>Dates</i>	<i>Name</i>	<i>Duration (hrs)</i>	<i># Spirals/Descents</i>
20-Jul	Engineering	4.4	3
21-Jul	Calibration	5.6	10
27-Jul	Northbound science/transit	9.4	4
31-Jul	Western NWT	8	6
2-Aug	Northern NWT	6.6	4
5-Aug	South-Central Alaska	6.2	5
6-Aug	Central Alaska	7	7
8-Aug	Southbound science/transit	8.1	8
8	<i>Totals:</i>	55.3	47



Extending 2017 ASCENDS Campaign into the Arctic in support of ABoVE



Science Questions:

- What are concentrations of atmospheric CO₂, CH₄ and WV at the ~ 9 km altitude of NASA DC-8 in the ABoVE domain ?
- What are vertical distributions of these gases at selected spiral-down locations ?
- What are measurement conditions (ie cloud and aerosol distributions, land and water reflectivity) that impact the column measurements of an IPDA lidar in the Arctic ?
- What are characteristics of IPDA lidar measurements made in the Arctic ?
 - How do their measurements follow pre-campaign measurement models ?
 - How do their measurements of column CO₂ (XCO₂) compare to column averages based on in situ measurements ?

Posters here:

- S. R. Kawa, et al., “DC-8 In Situ Measurements for ASCENDS and ABoVE 2017”
- J. B. Abshire et al., “2017 ASCENDS/ABoVE Airborne Campaign & Initial look at Pulsed Lidar Measurements of CO₂ Column Concentrations”
- M. Obland et al., “First Results for Active Remote Sensing of Carbon Dioxide During the ABoVE 2017 Airborne Field Campaign using the ACES Instrument”



Summary



- A very successful airborne campaign - all instruments & aircraft worked well
- Made lidar measurements of XCO₂ in Arctic for the 1st time
- 1st ASCENDS campaigns with long (34–70 deg lat.) north/south flight lines
- In situ measurements show CO₂ was lower & quite variable in Arctic
- Backscatter profile measurements show considerable variability in haze, & vertical and horizontal cloud structure in Arctic
- 47 spirals allow unprecedented comparisons of lidar vs in-situ XCO₂ for a wide variety of locations & atmospheric conditions

Status

- Overviews of campaign presented at the 2017 AGU & 2018 AMS meetings

Plans

- A large and rich data set
- Analyses on lidar measurements is in process - more on the way !
- In situ and lidar data (once available) will be archived, as requested
- More complete results: May 2018: at IWGGMS-14 meeting (Toronto)